

OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **NORTHWOOD LAKE** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *slightly worsening* in-lake chlorophyll-a trend, meaning concentrations are increasing. Chlorophyll concentrations were elevated this season, but remain below the average value for New Hampshire lakes. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.
- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *stable* trend in lake transparency. Transparency results were consistent with those of last season, and the average is just below the state mean. The decrease in transparency in August was most likely a result of the increased algal abundance, and rainy conditions at the start of sampling. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.
- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show an *improving* trend for in-lake

phosphorus levels, which means levels are decreasing. Both layers had similar values in August and October. Average phosphorus concentrations in the hypolimnion were the lowest the lake has ever experienced, and both layers had average concentrations below the New Hampshire median for total phosphorus. We hope to see phosphorus concentrations continue to decrease in the lake, as this will help to keep lake productivity at a healthy level. With the lake being lowered several feet each year it is likely excess phosphorus will be flushed from the lake basin. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- As part of the state's lake trophic classification program, DES biologists performed a comprehensive lake survey on Northwood Lake. All public lakes in the state are surveyed every ten to fifteen years. In addition to the tests normally carried out by VLAP, biologists tested for common metals, nitrogen, created a map of the bottom contours of the lake (bathymetry), and mapped the abundance and distribution of aquatic plants along the shores. For a complete copy of the raw data from the survey, please contact the DES Biology Section at (603) 271-2963. A final report should be available in 2002 and a copy can be found at any state library.
- Conductivity throughout the lake decreased this year from the higher results seen last season (Table 6). The excess of rainfall experienced this summer helped to increase the flushing rate of the inlets and the lake. The increased flushing tends to remove pollutants from the surface waters. Conductivity increases often indicate the influence of human activities on surface waters. This decrease is a positive sign for the lake. Septic system leachate, agricultural runoff, iron deposits, and road runoff can each influence conductivity readings.
- Phosphorus concentrations (Table 8) in Rt. 4 East Inlet were elevated this season. The turbidity of the sample (Table 11) was high at that time, indicating that the sample could have been contaminated with debris. Organic debris can raise phosphorus concentrations of samples and yield inaccurate results. Please be sure to only test inlets that have a sufficient flow for a clear sample.
- Dissolved oxygen was again high at all depths of the lake (Table 9). The probe sitting in the bottom sediment may have caused the low value at the very bottom. As stratified lakes age, oxygen is depleted

in the lower layer by the process of decomposition. The lack of this aging indicator is a sign of the lake's overall health.

- An herbicide treatment was performed early in the summer season this year. Milfoil was successfully reduced in many areas of the lake. Only two locations were found to still have actively growing populations. DES roped off these areas for milfoil containment purposes.

NOTES

- Monitor's Note (8/9/00): Raining at start.

USEFUL RESOURCES

Stormwater Management and Erosion and Sediment Control Handbook. NHDES, Rockingham County Conservation District, USDA Natural Resource Conservation Service, 1992. (603) 772-4385.

The Wetlands Resource, WD-WB-7, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

A Brief History of Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

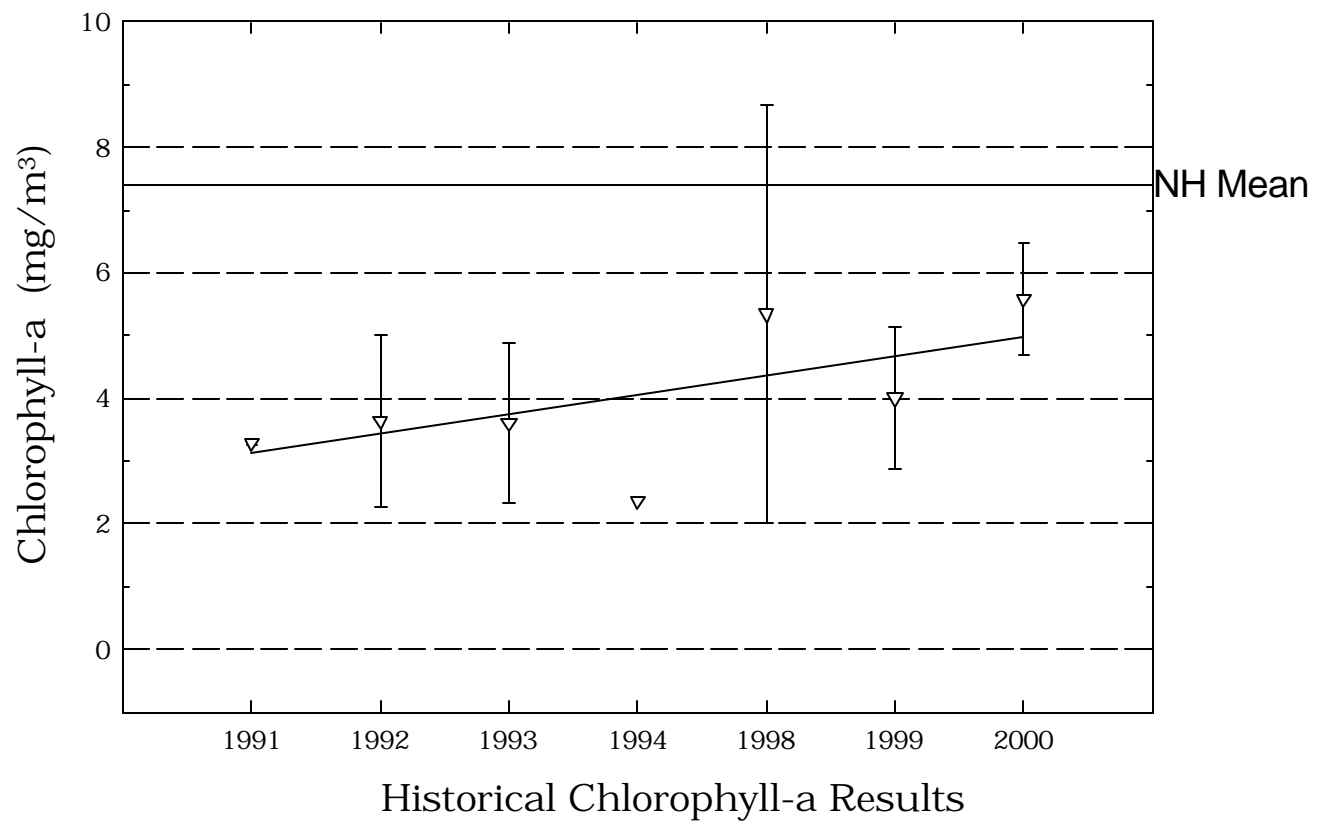
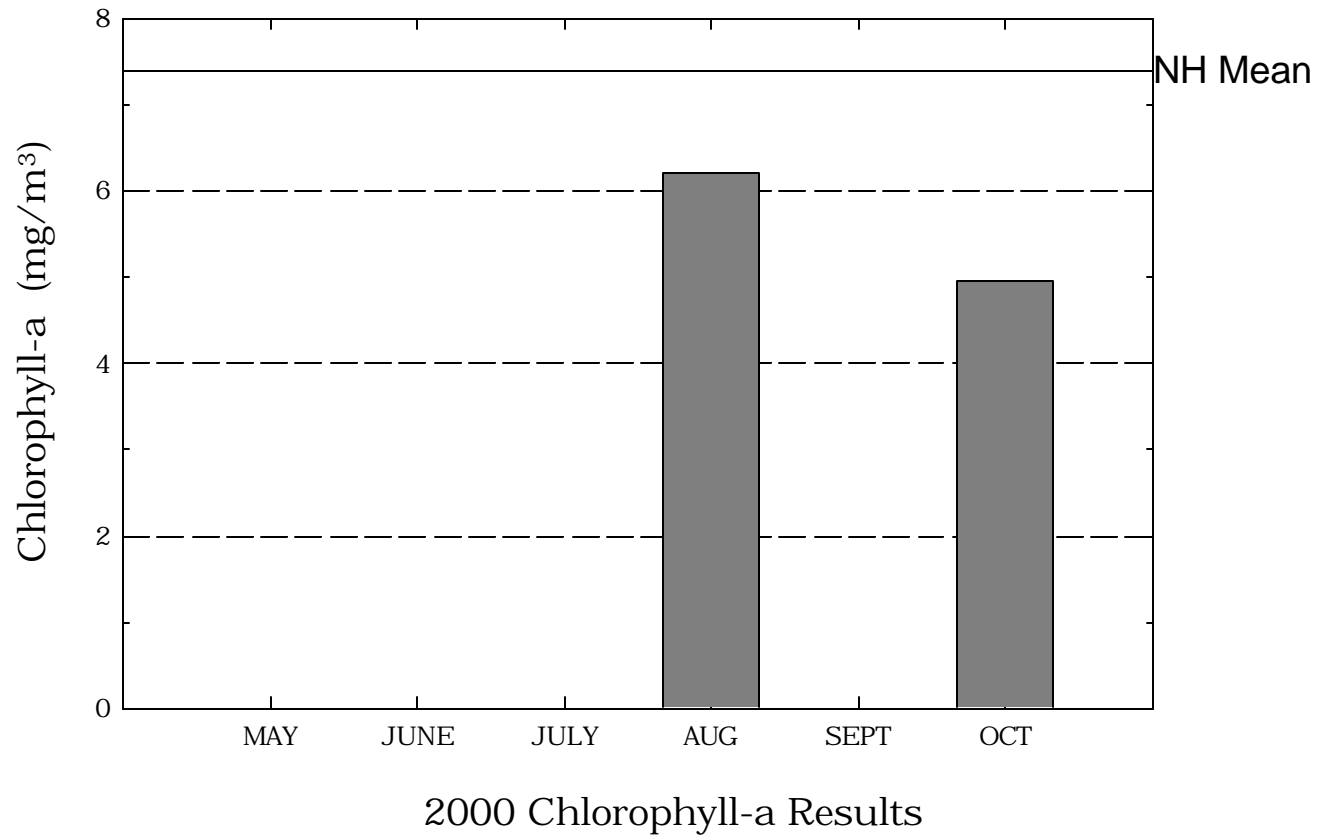
Effects of Phosphorus on New Hampshire's Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Road Salt and Water Quality, WD-WSQB-7, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Water Milfoil, WD-BB-1, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

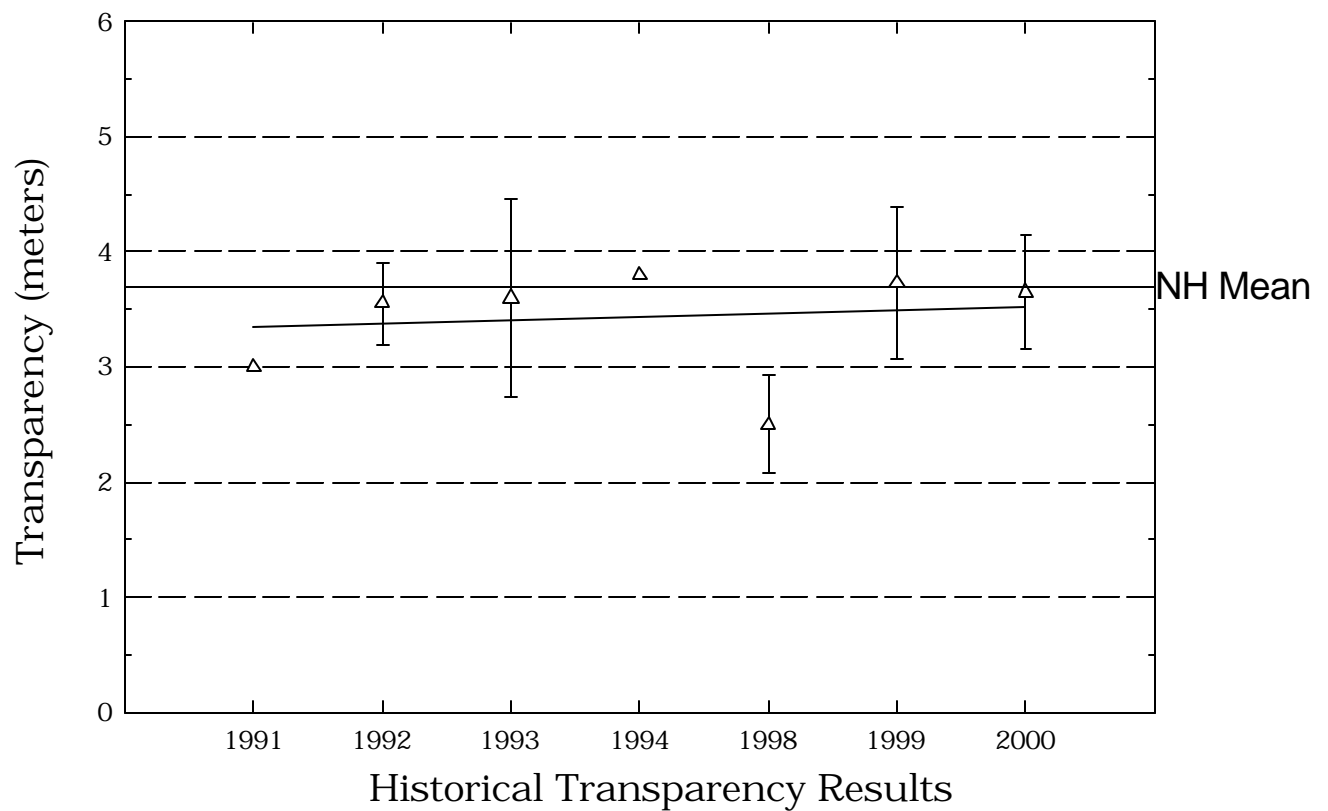
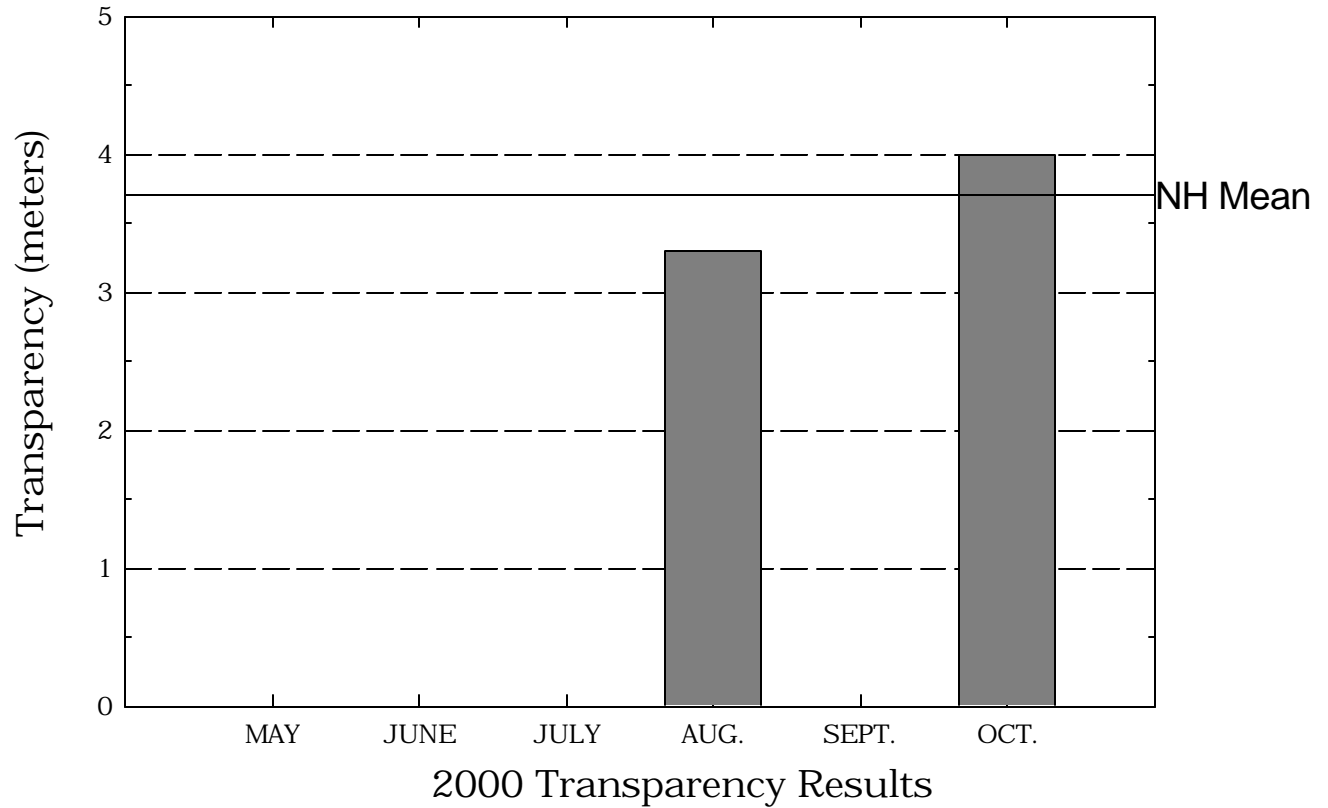
Northwood Lake

Figure 1. Monthly and Historical Chlorophyll-a Results



Northwood Lake

Figure 2. Monthly and Historical Transparency Results



Northwood Lake

Figure 3. Monthly and Historical Total Phosphorus Data.

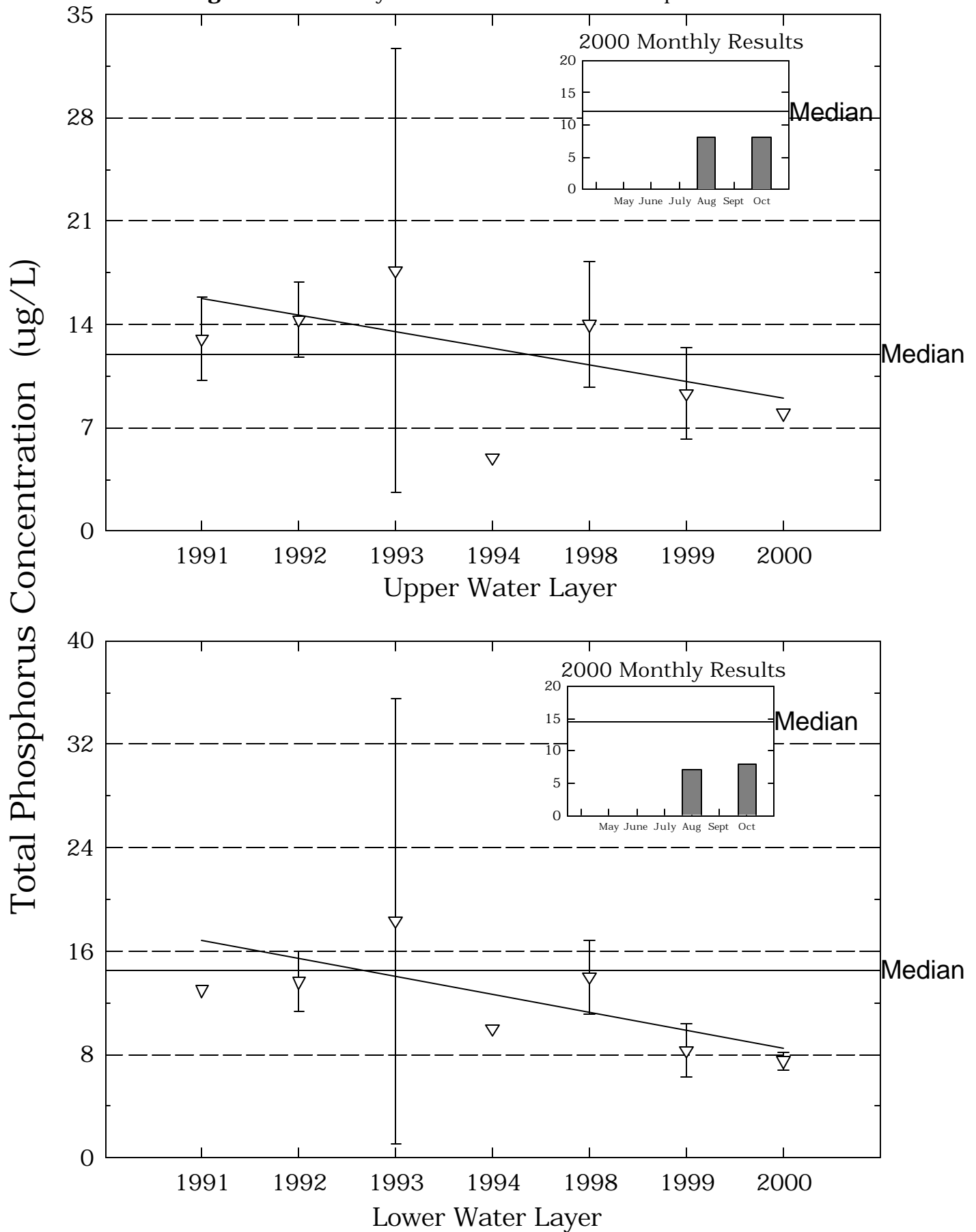


Table 1.**NORTHWOOD LAKE****NORTHWOOD**

**Chlorophyll-a results (mg/m³) for current year and historical
sampling periods.**

Year	Minimum	Maximum	Mean
1991	3.27	3.30	3.28
1992	2.73	5.22	3.65
1993	2.72	5.07	3.61
1994	2.37	2.37	2.37
1998	3.00	7.70	7.07
1999	3.27	5.31	4.00
2000	4.95	6.21	5.58

Table 2.

**NORTHWOOD LAKE
NORTHWOOD**

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06/13/1991	TABELLARIA	32
	STAUSTRUM	19
	CERATUM	17
07/16/1992	TABELLARIA	18
	MICROCYSTIS	18
	CERATUM	16
06/14/1993	TABELLARIA	33
	ASTERIONELLA	22
07/18/1994	ASTERIONELLA	47
	COELOSPHAERIUM	22
05/20/1998	ASTERIONELLA	33
	CYCLOTELLA	25
		-99
05/20/1998	ASTERIONELLA	33
	CYCLOTELLA	25
07/28/1999	TABELLARIA	56
	RHIZOLENIA	23
	ASTERIONELLA	10
08/09/2000	TABELLARIA	67
	DINOBRYON	18
	COSMARIUM	5

Table 3.**NORTHWOOD LAKE****NORTHWOOD**

**Summary of current and historical Secchi Disk
transparency results (in meters).**

Year	Minimum	Maximum	Mean
1991	3.0	3.0	3.0
1992	3.3	3.8	3.5
1993	2.8	4.5	3.6
1994	3.8	3.8	3.8
1998	2.2	2.8	2.3
1999	3.0	4.3	3.7
2000	3.3	4.0	3.6

Table 4.

**NORTHWOOD LAKE
NORTHWOOD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
BRIDGE INLET				
	1998	5.89	6.24	6.03
EPILIMNION				
	1991	6.59	6.80	6.65
	1992	6.64	6.78	6.69
	1993	6.67	6.79	6.72
	1994	6.53	6.53	6.53
	1998	6.41	6.76	6.55
	1999	6.22	6.41	6.33
	2000	6.43	6.63	6.52
HYPOLIMNION				
	1991	6.61	6.70	6.65
	1992	6.57	6.69	6.62
	1993	6.64	6.71	6.67
	1994	6.34	6.34	6.34
	1998	5.94	6.25	6.07
	1999	6.20	6.32	6.28
	2000	6.25	6.35	6.30
LOWER WTC INLET				
	1998	4.98	4.98	4.98
METALIMNION				
	1992	6.57	6.63	6.60
	1993	6.65	6.65	6.65

Table 4.

**NORTHWOOD LAKE
NORTHWOOD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
OUTLET	1991	6.55	6.55	6.55
	1992	6.65	6.74	6.68
	1993	6.67	6.72	6.69
	1995	6.78	6.78	6.78
	1999	5.94	6.69	6.25
	2000	6.29	6.40	6.34
PLEASANT POND INLET	1991	5.70	5.70	5.70
	1992	5.54	5.68	5.60
	1993	5.73	5.73	5.73
	1995	6.40	6.40	6.40
	1998	5.93	5.93	5.93
	1999	5.28	6.02	5.60
	2000	5.63	6.01	5.78
RT 107 INLET	1991	6.70	6.70	6.70
	1992	6.39	6.39	6.39
	1993	6.80	6.80	6.80
	1995	6.85	6.85	6.85
	1998	6.69	6.69	6.69
	1999	5.99	6.61	6.28
	2000	6.23	6.25	6.24

Table 4.

**NORTHWOOD LAKE
NORTHWOOD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
RT 4 EAST INLET	1991	6.62	6.62	6.62
	1992	6.56	6.69	6.63
	1993	6.68	6.95	6.79
	1995	6.58	6.58	6.58
	1998	6.54	6.54	6.54
	1999	6.10	6.82	6.43
	2000	6.39	6.48	6.43
RT 4 INLET	1991	6.27	6.27	6.27
	1992	6.09	6.31	6.18
	1993	5.94	5.94	5.94
	1998	5.88	5.88	5.88
RT 4 WEST INLET	1999	5.05	5.05	5.05
	2000	5.46	5.82	5.60
RT 4 WEST WETLAND	1999	5.16	5.16	5.16

Table 5.

NORTHWOOD LAKE

NORTHWOOD

Summary of current and historical Acid Neutralizing Capacity.

Values expressed in mg/L as CaCO₃.

Epilimnetic Values

Year	Minimum	Maximum	Mean
1991	3.40	4.40	3.73
1992	3.10	4.00	3.70
1993	2.50	3.40	2.93
1994	3.10	3.10	3.10
1998	2.90	3.00	2.95
1999	2.70	2.90	2.77
2000	2.20	3.10	2.65

Table 6.

**NORTHWOOD LAKE
NORTHWOOD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
BRIDGE INLET				
	1998	37.5	39.4	38.4
EPILIMNION				
	1991	73.4	75.9	75.0
	1992	75.5	78.5	76.8
	1993	77.2	84.1	81.4
	1994	80.7	80.7	80.7
	1998	57.5	68.1	62.8
	1999	78.8	80.2	79.4
	2000	77.0	80.1	78.5
HYPOLIMNION				
	1991	73.9	78.8	76.3
	1992	75.0	78.2	76.6
	1993	78.5	83.7	81.7
	1994	84.0	84.0	84.0
	1998	58.4	66.9	62.6
	1999	78.7	79.7	79.3
	2000	77.0	80.1	78.6
LOWER WTC INLET				
	1998	20.7	20.7	20.7
METALIMNION				
	1992	75.2	78.5	76.3
	1993	84.4	84.4	84.4

Table 6.**NORTHWOOD LAKE****NORTHWOOD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
OUTLET	1991	76.6	76.6	76.6
	1992	75.9	81.2	77.9
	1993	80.9	87.7	84.9
	1995	93.9	93.9	93.9
	1999	78.3	82.2	80.3
	2000	77.2	80.0	78.6
PLEASANT POND INLET	1991	75.0	75.0	75.0
	1992	66.4	66.8	66.6
	1993	76.2	76.2	76.2
	1995	71.1	71.1	71.1
	1998	65.2	65.2	65.2
	1999	68.1	93.1	83.8
	2000	69.9	70.1	70.0
RT 107 INLET	1991	68.3	68.3	68.3
	1992	72.0	72.0	72.0
	1993	62.8	62.8	62.8
	1995	119.2	119.2	119.2
	1998	62.4	62.4	62.4
	1999	69.7	211.7	140.7
	2000	71.1	74.0	72.6
RT 4 EAST INLET	1991	132.7	132.7	132.7
	1992	96.8	178.0	142.9

Table 6.

**NORTHWOOD LAKE
NORTHWOOD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
	1993	172.8	279.8	226.3
	1995	313.0	313.0	313.0
	1998	133.6	133.6	133.6
	1999	123.0	264.6	195.8
	2000	127.2	163.9	145.5
RT 4 INLET				
	1991	51.9	51.9	51.9
	1992	40.1	51.8	44.6
	1993	47.9	47.9	47.9
	1998	42.0	42.0	42.0
RT 4 WEST INLET				
	1999	77.9	77.9	77.9
	2000	49.2	73.8	61.5
RT 4 WEST WETLAND				
	1999	44.8	44.8	44.8

Table 8.**NORTHWOOD LAKE****NORTHWOOD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
BRIDGE INLET				
	1998	11	29	20
CORNFIELD SITE				
	1992	63	63	63
CULVERT				
	1993	62	62	62
E-2 BRIDGE				
	1992	36	36	36
EPILIMNION				
	1991	11	15	13
	1992	12	17	14
	1993	8	35	17
	1994	5	5	5
	1998	11	17	14
	1999	6	12	9
HYPOLIMNION	2000	8	8	8
	1991	13	13	13
	1992	11	15	13
	1993	6	38	18
	1994	10	10	10
	1998	12	16	14
	1999	6	10	8
	2000	7	8	7

Table 8.**NORTHWOOD LAKE****NORTHWOOD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
LOWER WTC INLET				
	1998	11	11	11
METALIMNION				
	1992	11	16	13
	1993	12	12	12
OUTLET				
	1991	19	19	19
	1992	16	24	20
	1993	15	64	32
	1995	15	15	15
	1999	12	20	16
	2000	11	14	12
PLEASANT POND INLET				
	1991	47	47	47
	1992	16	33	24
	1993	47	47	47
	1995	9	9	9
	1998	18	18	18
	1999	5	27	17
RT 107 INLET				
	1991	25	25	25
	1992	42	42	42
	1993	41	41	41
	1995	6	6	6
	1998	22	22	22

Table 8.**NORTHWOOD LAKE****NORTHWOOD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
	1999	9	14	12
	2000	10	15	12
RT 4 EAST INLET A				
	1993	59	59	59
RT 4 EAST INLET				
	1991	59	59	59
	1992	54	75	62
	1993	82	85	83
	1995	24	24	24
	1998	45	45	45
	1999	15	33	23
	2000	16	31	23
RT 4 INLET				
	1991	47	47	47
	1992	49	63	55
	1993	73	73	73
	1998	36	36	36
RT 4 WEST INLET				
	1999	21	21	21
	2000	10	14	12
RT 4 WEST WETLAND				
	1999	10	10	10
UPSTREAM BRIDGE				
	1993	40	40	40

Table 9.
NORTHWOOD LAKE
NORTHWOOD

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
August 9, 2000			
0.1	23.6	7.8	92.1
1.0	23.6	7.8	91.8
2.0	23.6	7.7	90.8
3.0	23.5	7.5	87.7
4.0	22.8	7.3	84.5
5.0	22.3	6.8	78.3
6.0	22.0	5.8	66.4
6.5	21.6	1.5	16.8

Table 10.**NORTHWOOD LAKE
NORTHWOOD****Historic Hypolimnetic dissolved oxygen and temperature data.**

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 2, 1991	6.0	22.0	8.5	97.8
July 16, 1992	5.5	22.0	7.4	85.2
June 14, 1993	5.8	18.0	10.9	113.0
July 18, 1994	6.5	23.0	1.4	16.0
July 28, 1999	6.0	25.0	4.0	48.7
August 9, 2000	6.5	21.6	1.5	16.8

Table 11.

**NORTHWOOD LAKE
NORTHWOOD**

**Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
BRIDGE INLET				
	1998	0.2	0.5	0.4
EPILIMNION				
	1998	0.8	0.9	0.8
	1999	0.4	0.9	0.6
	2000	0.5	0.7	0.6
HYPOLIMNION				
	1998	1.0	1.3	1.1
	1999	0.4	1.4	0.8
	2000	0.5	0.8	0.6
LOWER WTC INLET				
	1998	0.1	0.1	0.1
OUTLET				
	1999	1.0	1.4	1.1
	2000	0.9	1.2	1.1
PLEASANT POND INLET				
	1998	0.4	0.4	0.4
	1999	0.4	0.6	0.5
	2000	0.2	0.3	0.2
RT 107 INLET				
	1998	0.8	0.8	0.8
	1999	0.4	0.9	0.7
	2000	0.6	0.8	0.7
RT 4 EAST INLET				
	1998	2.1	2.1	2.1
	1999	0.8	1.8	1.2

Table 11.**NORTHWOOD LAKE
NORTHWOOD****Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
RT 4 EAST INLET	2000	0.7	4.8	2.7
RT 4 INLET	1998	1.3	1.3	1.3
RT 4 WEST INLET	1999	0.4	0.4	0.4
	2000	0.3	0.5	0.4
RT 4 WEST WETLAND	1999	0.4	0.4	0.4